

Doc.# 757

LINCOLN DIST.
CENTRE.

12500 CLAUSON AVE.

Santa Fe Springs

CA. 90670

FILE NO. 3

**SUMMARY REPORT
LINCOLN DISTRIBUTION CENTER
12500 SLAUSON AVENUE
SANTA FE SPRINGS, CALIFORNIA**

INTRODUCTION

The purpose of this report is to describe soil and groundwater investigations conducted by SCS Engineers at the Lincoln Distribution Center, located at 12500 East Slauson, Santa Fe Springs, California (Figure 1). These investigations include: a review of potential contaminated sites in the surrounding area, a soil vapor survey, installation of one new groundwater monitoring well, groundwater sampling and analysis, and free product recovery.

Site History

Six underground tanks ranging in size from 1,000 to 10,000 gallons, were removed from the site in June 1986. One tank contained motor oil, one contained waste oil, and four contained diesel fuel. Soil in the vicinity of some of the tanks contained petroleum hydrocarbons. A volume of soil equal to approximately 420 cubic yards was excavated and disposed off site during July 1986 (Subsurface Soil and Groundwater Quality Assessment, Lincoln Distribution Center, March 1993, Kleinfelder, Inc.).

Eleven ground water monitoring wells (LIC-1 to LIC-11) were installed during February and March 1988 by Diagnostic Engineering Incorporated (DEI) and Kleinfelder, Inc. (Kleinfelder) (Figure 2). These wells are approximately 50 feet deep and are screened from 30 to 50 feet below ground surface. Soils from the surface to a depth of approximately 26-28 feet consist primarily of clay. The wells are screened within a sand unit that lies below this depth. At the time of installation, the water surface was within the screened interval of the wells.

Low concentrations of petroleum hydrocarbons and chlorinated hydrocarbons were detected in several of these wells. Floating free hydrocarbon product (FHP) was present in two of the wells (LIC-2 and LIC-11). The source of FHP appeared to be a former underground diesel fuel storage tank located near well LIC-2.

As a result of the discovery of FHP, a remediation system was installed in October 1989 by Kleinfelder. The principal goal of the ground water remediation effort was to remove the FHP. The system was designed to pump water and FHP, separate FHP (which was disposed off-site), and treat the water (using carbon) to remove dissolved hydrocarbons prior to discharge. This system initially consisted of a dual pump system in well LIC-2; one pump removed product, the second pump was designed to create a depression on the groundwater surface in which to capture product. Later, a pump was installed in well LIC-4 in an attempt to enhance flow of product towards well LIC-2. Approximately 10,500,000 gallons of water were pumped through the treatment system. Between 1988 and 1993, water levels rose approximately 10 feet. In 1993 this system was found to not



be removing FHP and therefore operation was terminated. Since September 1993, FHP has been removed from the wells LIC-2 and LIC-11 either by manual bailing or with a passive recovery canister.

Groundwater samples collected by SCS Engineers during October 1994 confirmed previous indications of the presence of TCE, PCE, and TPH (diesel fuel) in several of the on-site wells. In addition, free hydrocarbon product was found to be present in two of the wells. As discussed above, FHP and dissolved diesel fuel in groundwater are present as a result of a leaking underground storage tank. TCE and PCE were detected in both up- and down-gradient wells. Chlorinated hydrocarbons are not known to have been used on-site.

Scope of Recent Investigations

The purpose of the recent study was to: (1) better define the extent of FHP on groundwater and diesel fuel components dissolved in groundwater, and (2) investigate the nature of PCE and TCE at the site and in particular, determine whether an on- or off-site source is more likely.

Recent water level increases have led to current levels above the top of the screened interval in the on-site wells. In addition, the presence of clay in the upper 26 to 28 feet of soil suggests that the shallow aquifer may be acting as a confined aquifer at this time. If this is the case, free hydrocarbon product is likely to be entrapped at the interface between the sandy aquifer and overlying clay. A new well with a shallower screened interval was suggested by RWQCB staff in order to determine if significant volumes of FHP existed in soils above the screened interval of wells LIC-2 and LIC-11. If this was the case, the new well would also facilitate product recovery from soils above the screened interval of the older wells. In addition, the boring for the new well would be sampled continuously in order to locate any sand lenses within the clay which could trap FHP. Groundwater sampling from on-site wells was also carried out in part to help define the extent of dissolved fuel components in groundwater.

A soil vapor survey was performed to determine if chlorinated hydrocarbons were present in shallow on-site soils which might suggest an on-site source. In addition, a review of regulatory databases of contaminated sites was conducted to determine if any sites with known PCE and TCE groundwater contamination are present in the vicinity of the subject site.

GEOLOGIC AND HYDROGEOLOGIC INFORMATION

The site lies within the Central Groundwater Basin of the Los Angeles Coastal Plain. The uppermost aquifer underlying the subject site consists of sand and silty sand which lies below a depth of approximately 26 to 28 feet. Above this is a clay layer which extends downward from the surface.

Most existing monitoring wells are screened in the sandy unit below the clay from a depth of 30 to 50 feet below ground surface. At the time of well installation, water levels were approximately 32 feet below ground surface. Historical monitoring data indicates that water levels rose approximately 10 feet between May 1988 and September 1993. Water levels measured during September 1993 were approximately 21 feet below ground surface. Therefore, fluid levels are presently above well screen intervals. It appears that



the screened aquifer is a confined aquifer at this time.

SOIL VAPOR SURVEY

A soil vapor survey was performed on August 11, 1995 at the site. The survey consisted of installing temporary probes to a depth of 5-feet below ground surface at 14 locations (see attached figure). Probe locations were placed on a grid with a 75-foot spacing centered on the Bemmers Truck Service building (Figure 3). This building was considered the only potential nearby source since the other on-site buildings are used only for warehousing.

Soil vapor samples were analyzed for chlorinated hydrocarbons (including TCE and PCE), and aromatic hydrocarbons (including benzene, toluene, ethylbenzene, and xylenes). The only compound detected was toluene, which was detected in only one sample (SV-14) at a concentration of 1.8 ug/l. Toluene may be a component of diesel fuel which is known to be present in soils and groundwater at the site in the general area of probe SV-14. Analytical data is included in Appendix A.

The absence of PCE and TCE in the samples analyzed indicates that the presence of these compounds in groundwater at the site is not a result of a surface or near surface release on this portion of the site. It strengthens our argument that these compounds are in groundwater as a result of migration from an off-site source.

REVIEW OF REGULATORY RECORDS

A review was conducted of regulatory databases for information on sites in the area adjacent to the subject site which may have impacted groundwater. Files of impacted sites were reviewed at the Los Angeles Department of Public Works and the Los Angeles Regional Water Quality Control Board.

The review of RWQCB files indicates that there is one nearby site to the west where soil and groundwater are known to have been affected by chlorinated compounds. The site is the former Chrysler New Car Preparation facility, located at 12140 Slauson Avenue. Chlorinated compounds were originally detected in soil at the time a clarifier was removed during 1988. Subsequently, seven groundwater monitoring wells were installed on the site. TCE, PCE, and several other compounds were detected in all of the wells including upgradient wells. Concentrations of TCE in groundwater ranged from 63 to 500 ug/l; concentrations of PCE ranged from 2.1 to 520 ug/l. This information is included in a report prepared by Converse Consultants, submitted to the RWQCB on January 4, 1991. The report indicates a groundwater gradient to the south. There is no information in the file that any subsequent monitoring or corrective action has taken place on the site. A copy of the initial letter to the RWQCB and a site map are included in Appendix B.

MONITORING WELL INSTALLATION

Since existing wells are screened at depths below the elevation of the piezometric surface, a new well (LIC-14) was requested by RWQCB staff with a higher screened interval. Well LIC-14 was installed adjacent to wells LIC-2 and LIC-11 (Figure 2). Continuous soil sampling was conducted in order to observe variations in soil type and locate water and hydrocarbon containing sections. Examination of the soil samples indicates that the upper



27 feet are composed almost entirely of clay. The first indication of saturated soil was in a silt layer below the clay. The highest FID readings and strongest hydrocarbon odors were detected in the zone immediately below the clay. Below the silt the soil is composed of silty fine sand and fine to medium sand with one gravelly zone at 32-feet. Water rose to approximately 20 feet below ground surface inside the well casing. FHP was not observed in the well at this time. The new well was screened between 10 and 40 feet below ground surface. A geologic boring log showing soils encountered and well construction details is included in Appendix C.

Materials and Methods

The monitoring well was drilled to a depth of 40-feet below ground surface with a truck mounted drill rig using hollow stem auger methods. A portable flame-ionization detector (FID) was used throughout drilling operations to screen for concentrations of organic vapors in the soil. Soil samples were collected for visual examination using a 5-foot long split spoon sampler. Before each sample was collected, the sampler and sample tubes were cleaned with a Liquinox solution, rinsed with clean tap water, and then rinsed with distilled water.

Monitoring Well Construction

The monitoring well was constructed with 4-inch diameter schedule 40 PVC casing. The lower 30 feet (10 to 40 feet below ground surface) was screened with 0.010 inch slots. The annular space surrounding the screen was filled with a filter pack of 2/16 sand. The sand was filled to 2-feet above the top of the screen. A 6-foot thick bentonite seal was placed above the filter pack. A locking well cover was cemented in place above the casing.

Well Development

The well was developed by a combination of surging and bailing. First the well was bailed to remove standing water and sediment within the casing. A surge block was then used to force water into and out of the well screen and remove fine sediment surrounding the well screen and improve the flow characteristics of the well. The surge block and bailer were steam cleaned prior to being introduced to the well. After surging, the well was bailed again until the water removed is relatively free of sediment.

GROUNDWATER SAMPLING

A discussion of field methods, laboratory data, and a brief comparison with previous monitoring events are presented below. Complete laboratory reports and chain-of-custody documentation are included in Appendix D. Monitoring well data and water level measurements are included in Table 1. Also included is a groundwater contour map (Figure 2).

Field Methods

Groundwater monitoring took place on September 6 and 7, 1995. Prior to purging, water levels were measured in all on-site wells using an electrical well sounder (Table 1). Following water level measurements, wells were each purged of a minimum of three well volumes prior to collecting groundwater samples. During purging, measurements were



taken of temperature, pH, turbidity, dissolved oxygen, and specific conductance (EC). Temperature ranged from 22.4 to 24.3 C. Dissolved oxygen concentrations ranged from 10.3 to 14.4 ppm. Specific conductance ranged from 1,770 to 2,040. All wells had pH values which were near neutral (6.7 to 8.3). Following purging, groundwater samples for inorganic analyses were collected from the pump discharge after slowing the rate of flow. The wells were allowed to stand until turbidity values were below 10 NTUs. Samples for TPH (EPA 8015(D)) and volatile organic compound analyses (EPA Method 601/602) were subsequently collected with a Teflon bailer. An individual bailer was dedicated to each well.

The pump and bailer were cleaned with a Liquinox solution and rinsed, first with clean tap water, and then with deionized water prior to sampling each of the wells. Groundwater samples were placed in pre-cleaned, laboratory supplied containers which were labelled and placed in a chilled ice chest for transportation to the Sterling Analytical Laboratory in Signal Hill, California. Standard chain-of-custody procedures were followed.

Analytical Results

Groundwater samples from the three wells were analyzed for nitrate, sulfate, Total Petroleum Hydrocarbons as diesel fuel (TPH-D) by Modified EPA Method 8015, and volatile halogenated and aromatic hydrocarbons by EPA Methods 601 and 602. Analytical results are summarized on Tables 2 and 3. A complete laboratory report is included in Appendix D.

Sulfate and nitrate were analyzed to help determine if natural degradation of petroleum hydrocarbons is taking place in groundwater. Concentrations of sulfate ranged from 270 to 591 mg/l (ppm). Concentrations of nitrate ranged from 6.0 to 20.4 mg/l. No conclusive spatial pattern was indicated by the data.

Diesel fuel was detected in wells LIC-4, -5, -7, -10, and -14 which are all in the area of the former underground tanks. TPH-D concentrations ranged from 0.3 to 21.6 mg/l, with the highest concentration in well LIC-14 (Figure 4).

Benzene, ethylbenzene, and xylenes were detected only in well LIC-14 at concentrations of 5.3, 5.4, and 1.4 ug/l (ppb). Tetrachloroethene (PCE) was detected in all but one (LIC-10) of the nine wells sampled. Concentrations of PCE ranged from 2 to 67 ug/l (Figure 5). Trichloroethene (TCE) was detected in all of the nine wells sampled at concentrations ranging from 1 to 14 ug/l. No other chlorinated hydrocarbons were detected.

RECENT PRODUCT RECOVERY

In September 1993, a thickness of 0.06 feet of FHP was measured in well LIC-11. FHP thickness increased to 0.43 feet in April 1994, and a passive recovery canister was installed during May 1995. Since this time, FHP thickness in the well has been reduced to a sheen. Approximately 2.5 gallons of FHP has been removed from the well between September 1993 and September 1995. Of this volume, less than 0.5 gallons was recovered during 1995.

A thickness of 0.23 feet of FHP was detected in well LIC-2 during April 1994. During October 1994, a thickness of 1.96 feet was measured. A passive recovery canister was



installed in this well during November 1994. Since this time, FHP thickness has been reduced to a sheen. Approximately 7 gallons of FHP was removed from this well between September 1993 and September 1995. Of this volume, approximately 1 gallon was removed during 1995.

CONCLUSIONS AND RECOMMENDATIONS

The soil vapor investigation did not indicate the presence of chlorinated hydrocarbons in shallow soils at the subject site. This indicates that there is no surface or near surface source in this portion of the site.

Chlorinated hydrocarbons (PCE and TCE) were detected in groundwater in all on-site wells including upgradient as well as downgradient wells (Figure 5).

The soils encountered while drilling the boring for LIC-14 indicate that competent clay comprises the upper 27 feet of soil. Depth to water measurements taken during September 1995 are on the order of 18 to 20 feet. Therefore, groundwater in the shallow aquifer is confined at this time. Examination of the soil profile from the boring indicates that the hydrocarbon product occurs predominantly in the upper 1 to 2 feet of silt and sand immediately underlying the clay.

Groundwater flow direction is to the southwest with a gradient of approximately 0.0014 feet/foot or 7.6 feet/mile. This is similar to the gradient observed during September 1993 and October 1994. Water levels are approximately 2-feet higher than levels measured during the previous groundwater sampling episode conducted in October 1994.

Laboratory analyses of groundwater samples indicate that petroleum hydrocarbons (FHP and dissolved) are limited to the area of the former underground tanks and do not appear to be migrating off-site (Figure 4).

Soil vapor and groundwater monitoring data suggest that TCE and PCE in groundwater are derived from an off-site source. Due to the prolonged groundwater pumping which occurred at the site, TCE and PCE may be derived from a source which is not directly upgradient of the site. Based on this, no further action is recommended regarding TCE and PCE at this time.

Data from drilling well LIC-14, from groundwater monitoring, and from FHP recovery suggest that only small amounts of diesel hydrocarbons remain at the site. Based on the fact that the groundwater in the area of the diesel plume contains oxygen and nutrients such as nitrogen, it is likely that biodegradation of hydrocarbons is occurring naturally. A meeting with RWQCB staff to discuss closure issues is recommended.



FIGURES AND TABLES



Table 1.
Monitoring Well Data
Lincoln Distribution Center, Santa Fe Springs
September 1995

Well Number	R.P. Elev. (ft — MSL)	Depth to Water	Screen Interval	Ground Water Surface Elev. (ft. — MSL)
LIC-1	155.78	18.27	29-49	137.51
LIC-2	153.53	16.39	29-49	137.14
LIC-3	155.41	17.85	27-47	137.56
LIC-4	156.81	19.75	30-50	137.06
LIC-5	156.58	19.54	30-50	137.04
LIC-6	156.20	19.18	30-50	137.02
LIC-7	156.38	19.25	30-50	137.13
LIC-8	156.48	---	30-50	---
LIC-9	155.38	18.17	30-50	137.21
LIC-10	156.26	19.03	30-50	137.23
LIC-11	156.13	19.04	30-50	137.09
LIC-12	155.89	18.82	20-50	137.07
LIC-13	154.85	---	20-50	---
LIC-14	?	19.68	10-40	---

RP = Reference Point MSL = Mean Sea Level

All water levels measured on September 6, 1995

Well LIC-8 could not be opened, LIC-13 could not be found.

Table 2.
Summary of Analytical Results – Ground Water
Lincoln Distribution Center, Santa Fe Springs

WELL NUMBER	DATE SAMPLED	TPH (8015M)	--- EPA 601 ---		----- EPA 602 -----			
			TCE	PCE	BENZENE	TOLUENE	E-BENZENE	XYLENES
LIC-1	8-89	<0.1	2	30	NA	NA	NA	NA
	2-93	NA	NA	NA	NA	NA	NA	NA
	10-94	NA	2	12	<.07	<1.0	<1.0	<1.0
	9-95	<0.1	1	2	<.07	<1.0	<1.0	<1.0
LIC-2	8-89	55	30	20	NA	NA	NA	NA
	2-93	product	NA	NA	NA	NA	NA	NA
	10-94	product	NA	NA	NA	NA	NA	NA
	9-95	product	NA	NA	NA	NA	NA	NA
LIC-3	2-88	NA	<5	19	<5.0	<5.0	<5.0	<5.0
	9-89	NA	1	45	NA	NA	NA	NA
	2-93	<0.50	<1.0	<1.0	<1.0	<2.0	<2.0	<1.0
	10-94	NA	10	13	<.07	<1.0	<1.0	<1.0
	9-95	<0.1	7	12	<.07	<1.0	<1.0	<1.0
LIC-4	3-88	100	NA	NA	<20	<20	<20	<20
	2-93	<0.50	2	13	<1.0	<2.0	<2.0	<1.0
	10-94	2.4	7	18	<.07	<1.0	<1.0	<1.0
	9-95	1.4	8	16	<.07	<1.0	<1.0	<1.0
LIC-5	3-88	<2	NA	NA	NA	NA	NA	NA
	2-93	<0.50	3	29	<1.0	<2.0	<2.0	<2.0
	10-94	<0.1	31	233	<.07	<1.0	<1.0	<1.0
	9-95	0.3	12	67	<.07	<1.0	<1.0	<1.0
LIC-6	3-88	<2	NA	NA	NA	NA	NA	NA
	2-93	<0.50	<1.0	<1.0	<1.0	<2.0	<2.0	<2.0
	10-94	NA	NA	NA	NA	NA	NA	NA
	9-95	<0.1	14	20	<0.7	<1.0	<1.0	<1.0
LIC-7	3-88	<2	NA	NA	<20	<20	<20	<20
	4-88	<1	NA	NA	NA	NA	NA	NA
	2-93	2.8	2	<1	2	<2.0	<2.0	2
	10-94	1.1	17	196	<.07	<1.0	<1.0	<1.0
	9-95	8.4	11	43	<.07	<1.0	<1.0	<1.0

Notes: NA = Not Analyzed ND = Not Detected

TPH data are in mg/l (ppm), EPA 8010 and 8020 data are in ug/l (ppb)

2-93 Sampled by Kleinfelder, 10-94 and 9-95 Sampled by SCS Engineers

Table 2.
Summary of Analytical Results – Ground Water
Lincoln Distribution Center, Santa Fe Springs

WELL NUMBER	DATE SAMPLED	TPH (8015M)	-- EPA 601 --		----- EPA 602 -----			
			TCE	PCE	BENZENE	TOLUENE	E-BENZENE	XYLENES
LIC-8	4-88	<1	NA	NA	NA	NA	NA	NA
	2-93	<0.50	<1	4	<1	<2.0	<2.0	2
	10-94	NA	NA	NA	NA	NA	NA	NA
	9-95	NA	NA	NA	NA	NA	NA	NA
LIC-9	4-88	<2	NA	NA	NA	NA	NA	NA
	2-93	<0.50	<1	9	<1	<2.0	<2.0	<2
	10-94	NA	NA	NA	NA	NA	NA	NA
	9-95	<0.1	5	50	<0.7	<1	<1	<1
LIC-10	4-88	<2	NA	NA	NA	NA	NA	NA
	2-93	<0.50	1	3	<1	<2.0	<2.0	<2
	10-94	NA	NA	NA	NA	NA	NA	NA
	9-95	0.5	2	<1	<0.7	<1	<1	<1
LIC-11	4-88	<2	NA	NA	NA	NA	NA	NA
	2-93	product	NA	NA	NA	NA	NA	NA
	10-94	product	NA	NA	NA	NA	NA	NA
	9-95	product	NA	NA	NA	NA	NA	NA
LIC-12	2-93	<0.50	1	9	<1	<2.0	<2.0	<2
	10-94	NA	NA	NA	NA	NA	NA	NA
	9-95	NA	NA	NA	NA	NA	NA	NA
LIC-13	2-93	<0.50	<1	<1	<1	<2.0	<2.0	<2
	10-94	NA	NA	NA	NA	NA	NA	NA
	9-95	NA	NA	NA	NA	NA	NA	NA
LIC-14	9-95	21.6	3	24	5.3	<1.0	5.4	1.4

Notes: NA = Not Analyzed ND = Not Detected

TPH data are in mg/l (ppm), EPA 8010 and 8020 data are in ug/l (ppb)

2-93 Sampled by Kleinfelder, 10-94 and 9-95 Sampled by SCS Engineers

Table 3.
Summary of Groundwater Monitoring Data -- Inorganic Compounds
Lincoln Distribution Center, Santa Fe Springs
September 1995

Well Number	Specific Conductance	pH	Temp (c)	Dissolved Oxygen	NO3	SO4
LIC-1	1860	8.4	23.5	11.9	18.7	400
LIC-2	Not Sampled -- Product in Well					
LIC-3	1950	6.7	23.7	10.4	11.4	591
LIC-4	1780	6.9	23.5	14.4	18.5	395
LIC-5	1860	6.8	24.3	11.5	9.6	270
LIC-6	2040	7.0	23.7	11.7	6.0	562
LIC-7	1910	6.9	22.4	10.3	20.4	468
LIC-8	Not Sampled					
LIC-9	1870	7.0	23.9	11.7	17.8	421
LIC-10	1790	6.9	23.3	13.5	19.0	417
LIC-11	Not Sampled -- Product in Well					
LIC-12	Not Sampled					
LIC-13	Not Sampled					
LIC-14	1770	6.8	23.4	12.8	10.1	291

Well LIC-8 could not be opened, LIC-13 could not be found.

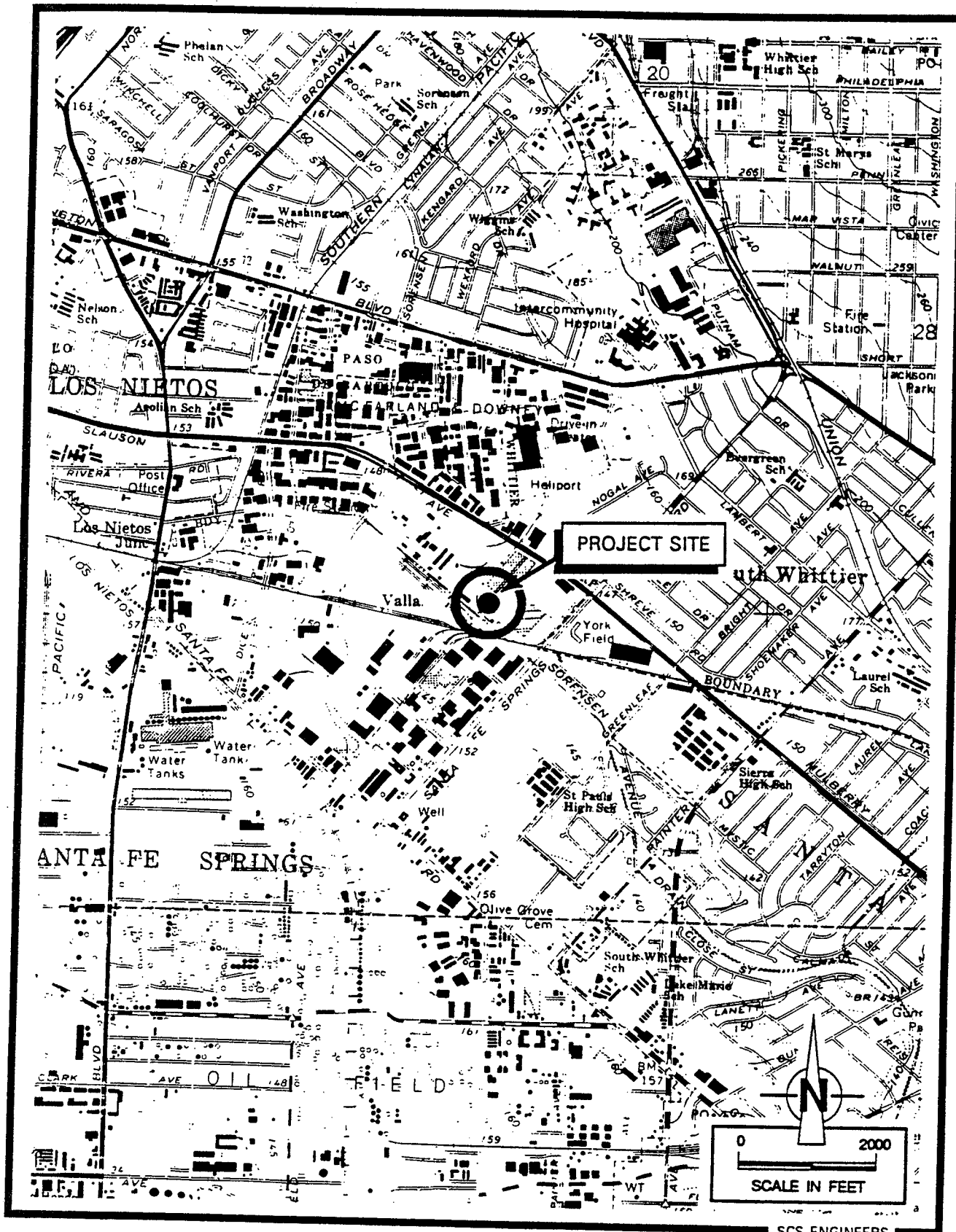


Figure 1. Project Site Location.

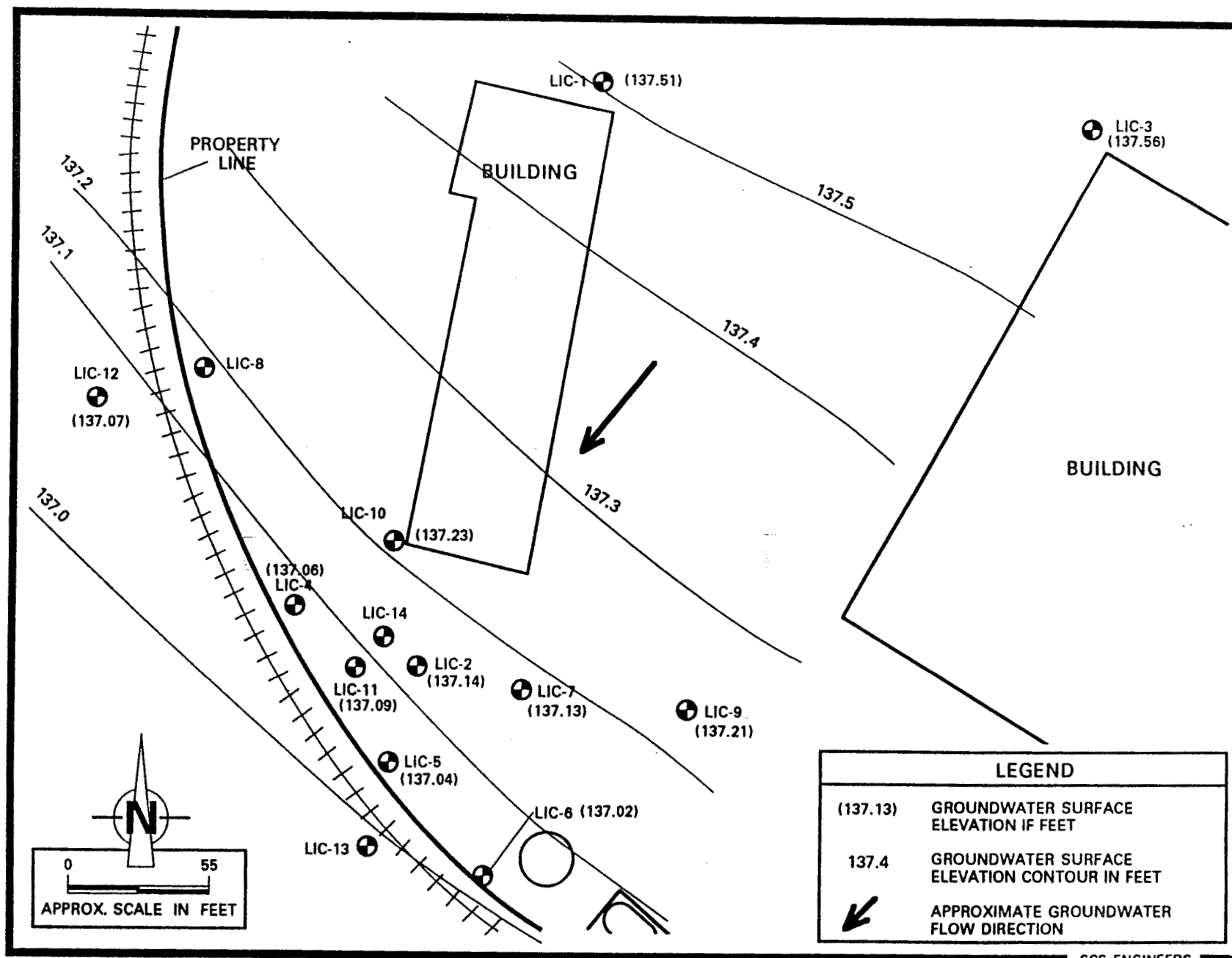


Figure 2. Groundwater Contour Map, September 6, 1995.

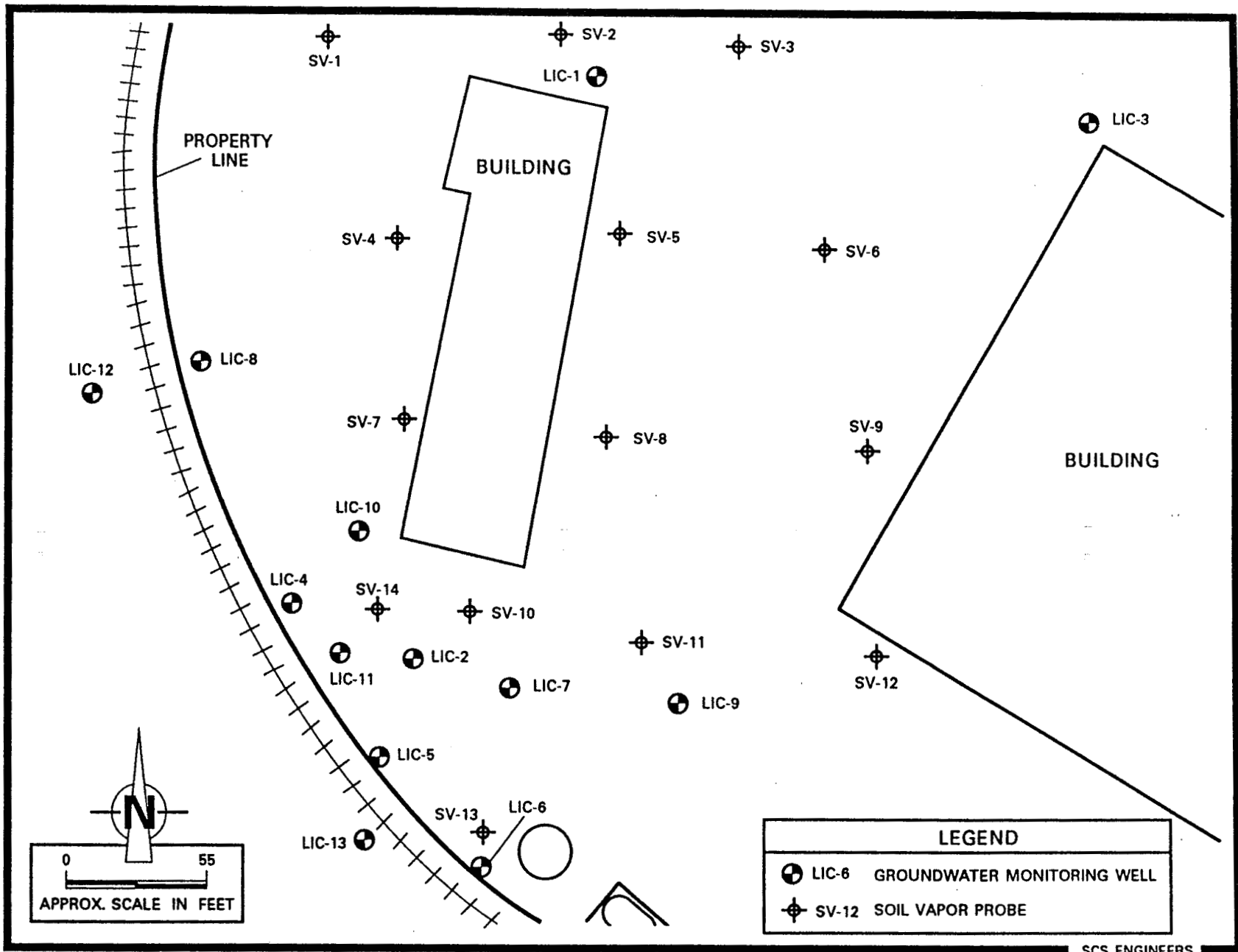


Figure 3. Map Showing Soil Vapor Sample Locations.

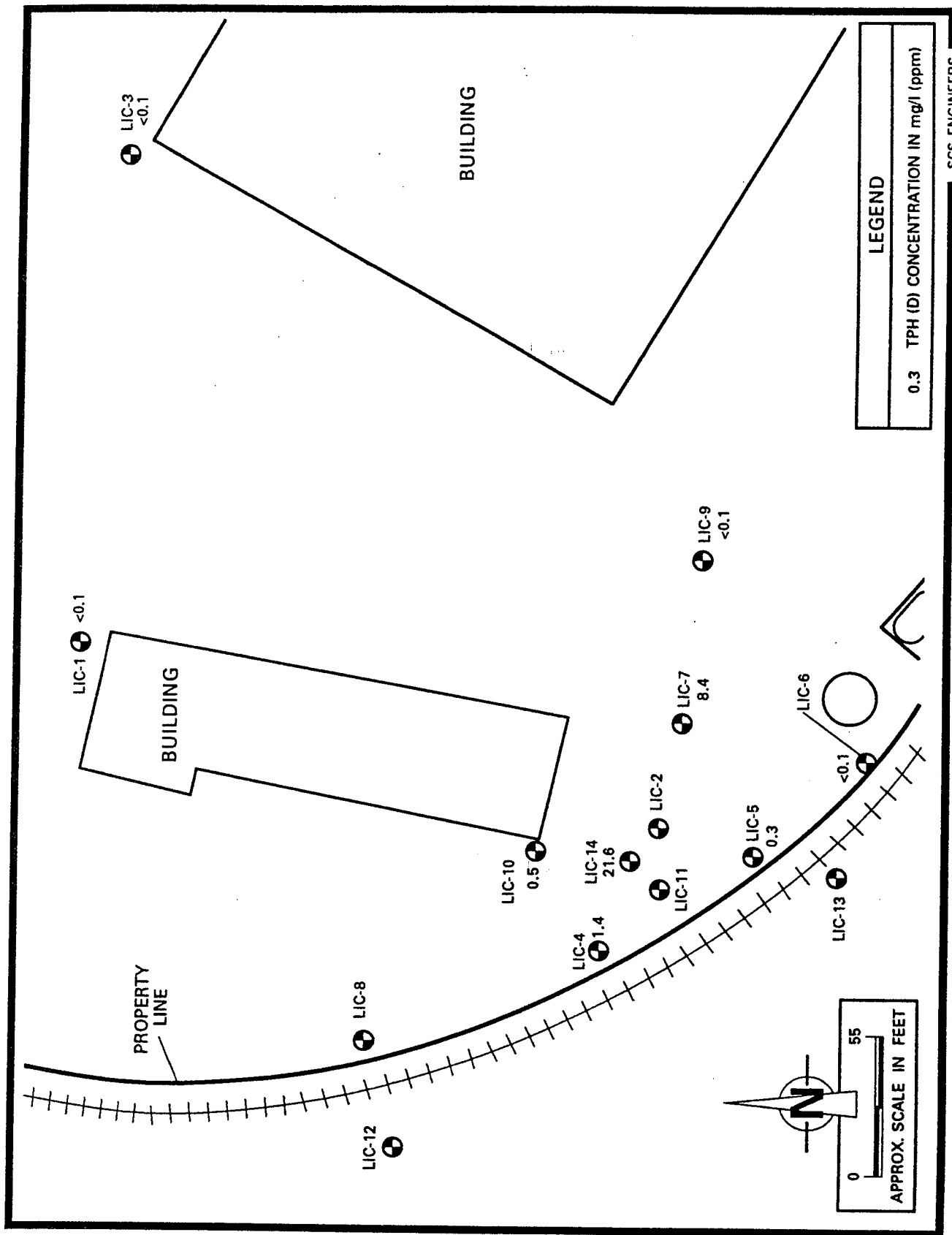


Figure 4. Map Showing Concentrations of TPH (D) in Groundwater, September 1995.

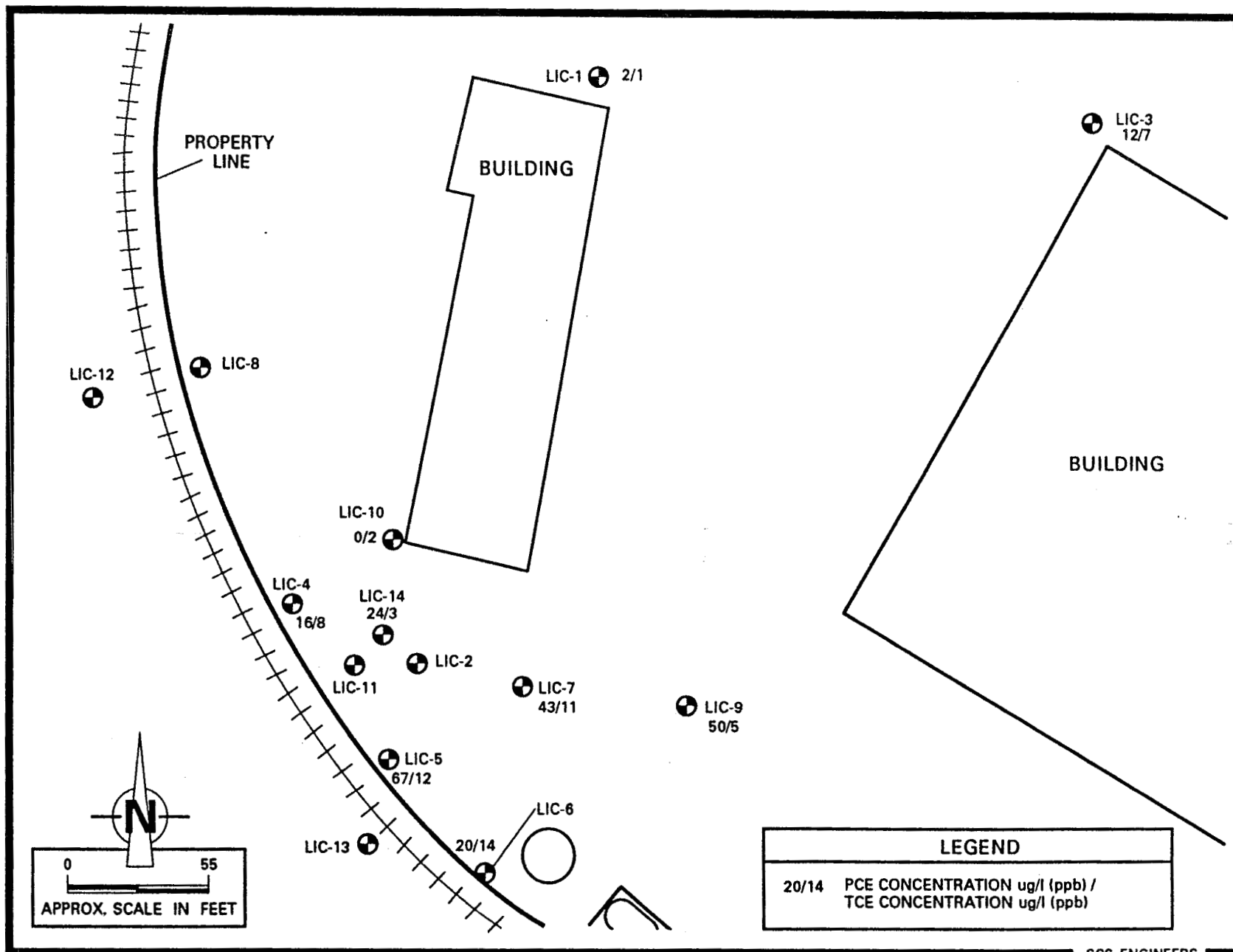


Figure 5. Map Showing Concentrations of PCE and TCE in Groundwater, September 1995.